Adopting the Unknown through the Known

Supporting user interaction of non-idiomatic technologies in exhibitions through known idioms of conventional technologies

Vistisen, Peter; Østergaard, Claus Møller; Krishnasamy, Rameshnath Kala

Published in:
Design for Next

DOI (link to publication from Publisher):
10.1080/14606925.2017.1352875

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

DESIGN FOR NEXT
EAD12-ROME

Design for Next

12th EAD Conference
Sapienza University of Rome
12-14 April 2017

Adopting the Unknown through the Known
Supporting user interaction of non-idiomatic technologies in exhibitions through known idioms of conventional technologies

Peter Vistisen, Claus Pertou Østergaard, Rameshnath Kala Krishnasamy

Aalborg University – Department of Communication & Psychology
Corresponding author e-mail: vistisen@hum.aau.dk

Abstract: When designing for the next wave of technologies, a challenge is how to culturally appropriate the semantic idioms of new technology to users with little experiential knowledge about the technology. This is especially a challenge, when more and more attractions are becoming unmanned, with little possibility for guidance. In this paper, we hypothesise that non-idiomatic technologies can be supported by leveraging existing idiomatic knowledge on more conventional technologies and thus lower the participation barrier. In two cases collected with several Danish attractions we experimented with supporting design with traditional technology, such as video signs, social media and physical signs to assess how idiomatic formats could facilitate the use of the non-idiomatic technology. We contribute with a set of lessons learned for how non-idiomatic design situations can be facilitated through using the users existing knowledge with more conventional technological practices.

Keywords: Non-idiomatic technology, design idioms, mobile user experience, contextual design, emerging technology, user experience design

1. Introduction

Today, we face more and more design situations where the user experience happens on the move, utilizing both mobile as well as contextual technologies, which has made it increasingly challenging to rely on known repertoires of experiential knowledge of how to use new technology (Fällman 2003, Löwgren & Stolterman 2004, Lindel 2012). The area of interest of this paper is situations where new technology is utilized in contexts, where majority of users lack said experiential knowledge. What is lacking can be described as design idioms - the conventions that are learnt, rather than analogically or metaphorically transferred (Cooper et al 2012). Consequently, in this paper we label this sort of design situations as non-idiomatic, following the terminology developed by e.g. Löwgren (2012, 2016), Lindel (2012), and Vistisen (2016).

As an example, idioms support a user's understanding of how the interface on a web-site is to be interacted with, how the output is perceived, and how the user knows what to do next. This happens due to the user's experiential knowledge of the idioms of web-sites - even if the particular web-site is

new in content and aesthetic. Thus, idioms can be regarded as being concerned with the cultural appropriation of the semantics of a given technology or genre of technological use case, which over time has been rooted as experiential knowledge. When few or no idioms exist, which is often the case with new emerging digital technologies (Lindel 2012, Löwgren & Stolterman 2004, Vistisen 2016) the user does not have the experiential knowledge needed to fill in the blanks of the technology, making it harder to understand the utility, usability, and desirability of what Buchanan (2001) labels the ontological synthesis of what the designed 'product' is.

In this paper, we investigate whether on-boarding non-idiomatic design concepts can be supported by leveraging on idiomatic knowledge with more conventional technologies - both digital and analogue, and thus ease the on-boarding for users. With this, we pose the research question, can the use of non-idiomatic technologies be facilitated through idiomatic technological practices?

The study is rooted in 'research through design' (Forlizzi et al 2009), treating the ultimate particular as knowledge outputs regarding broader design issues. As such, in line with Forlizzi et al, we adhere to the notion that research done through design, can lead to broader guidelines beneficial for design. We present the results of two separate case studies concerned with the same field (the experience economy). Both cases deal with the same genre of non-idiomatic technology (alternate reality games), and are further also challenged by operating in unmanned contexts, where little guidance or support can be given to assist users in assessing the potential user experience of the technological concept. Through the analysis of each case we have presented the qualitative and quantitative data to both support the identification of the issues of on-boarding users onto the digital solutions, but also to provide provisional evidence of that the issue did not arise from the specific digital concept itself. While we cannot fully assess that the on-boarding issues were not due to the concepts themselves, we argue the data gives some merit to claiming that when the users were actually successfully on boarded, they also had a sustained and desirable user experience from the use.

2. Case 1: Augmented reality in an aqua zoo

The North Sea Oceanarium is a Danish aqua zoo with an aim to inform visitors through edutainment activities. As part of its 2020 strategy, a focus was established on creating digital extensions of the physical experiences. The initiative was the design of a mobile augmented reality application, the North Sea Movie Maker (Huge Lawn 2013). The app uses of a novel approach to markerless augmented reality in which the user records live footage during their visit to the zoo. The footage becomes distorted in real-time by the app, while special effects are put on top of the video, generating a scene where fish and objects interact with the filmed guests. The video is saved onto the smartphone, and the app cuts seven small videos into one movie with special effects (figure 1).

Figure 1: The user journey of the guest using the augmented reality app 'North Sea Movie Maker'

At the time of the project, Augmented reality as a technology had yet to establish itself on the end-user market. This was evident insofar as the technology did not have many established design idioms, and only limited experiential knowledge among the common user (Carmigniani et al 2011, Krevelen & Poelman 2010). This made augmented reality an interesting case for studying the design and usage challenges, being a still largely non-idiomatic technology.

2.1 Unmanned vs. manned facilitation of 'first use'

Our first test was to establish how a manned vs. unmanned situation affected the usage. For the experiment we created two setups. First, a manned setup, where the staff actively approached guests, and instructed the app use. Secondly we made an unmanned setup where the guest was only guided by posters, and an introduction leaflet.

When comparing the usage data from the two setups, we saw no significant change in completion rate of the active users. However, there was a dramatic drop by an average of more than 50% of the total usage in days after the guided introduction stopped (figure 2).

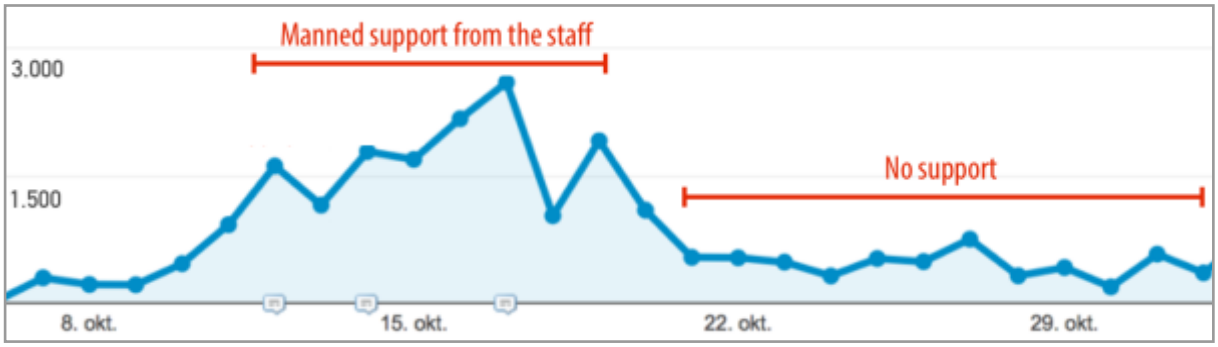

Figure 2: App usage data showing the difference between the manned and unmanned support of the app

This was even though the average number of guests in the aqua zoo was comparable. From our observations, the usage drop was not due to a lack of awareness about the availability of the app. The majority of the observed guests both oriented themselves of the posters of the digital zones, as well as briefly read the introduction. Instead, we argue that the conversion from guest to user was inhibited by the unclear non-idiomatic convention of what the concept was, how the interaction between context and app would be carried out, and how the concept was a desirable addition to the visit.

This was evident from response given by several guests during the manned setup. An oft-repeated inquiry was some variation of 'what does it do?', before agreeing to capture their first augmented reality video on the digital zones. We see this as coherent to the observed unmanned challenge of communicating the desirability of a non-idiomatic technology

Thus, the core challenge was how to facilitate a reflection on the desirability dimension of 'what value of the app is', and only secondarily the utility dimension of 'which features does the product have', and usability dimension of 'how to use the app'.

2.2 Example 1: Video posters

We experimented with building upon the traditional exhibition practice of designing posters and signs. We hypothesized that designing a more dynamic representation of the information posters would support the guest's decoding of the intended user experience behind the app, and thus assessing on the desirability of the app. We designed a video-based poster (figure 3), and recorded a short video scenario with a group of guests using the augmented reality app during their visit. The

video guide format could be seen as an idiomatic technology itself, communicating the intended use situation of the non-idiomatic app. As such, the video did not represent an interface walkthrough, but sought to portray the cultural patterns of augmented reality as a way to enrich the experience as a group.

The idiom of this use of video can be understood through Chow's (1989) notion of video as a persuasive change agent and Raijmakers (2009) use of video to create empathy. The aim of the video poster was to provide a recognizable (and thus idiomatic) medium to facilitate an empathetic understanding of the possible user experience.

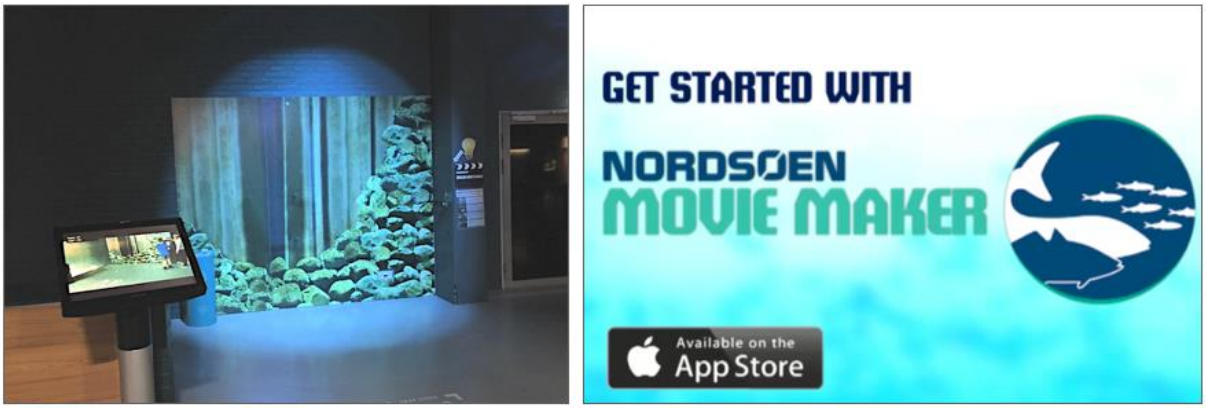

Figure 3: The video poster stander besides the digital zone (left) and the intro screen of the video guide loop (right)

We limited the video poster implementation to one of the seven digital zones as a testbed. We observed the guest's interaction with the video poster, and, once again looked for patterns in the usage data in the test period.

From our observations, it was evident that the presence of the video monitor in the exhibition was an eye-catching element, which drew the attention of the guests. We cannot fully assess whether this was due to an inclination towards completion inherent in the video or simply due to the presentation of a different type of content compared to the rest of the exhibit. However, the observed pattern was an increase in both awareness and duration of attention from the guests compared to the static posters.

However, when comparing the app use before and after implementing the poster we saw little correspondence between the increased awareness and guests using the app. In the week before implementation, and the following two weeks, the usage pattern looked the same:

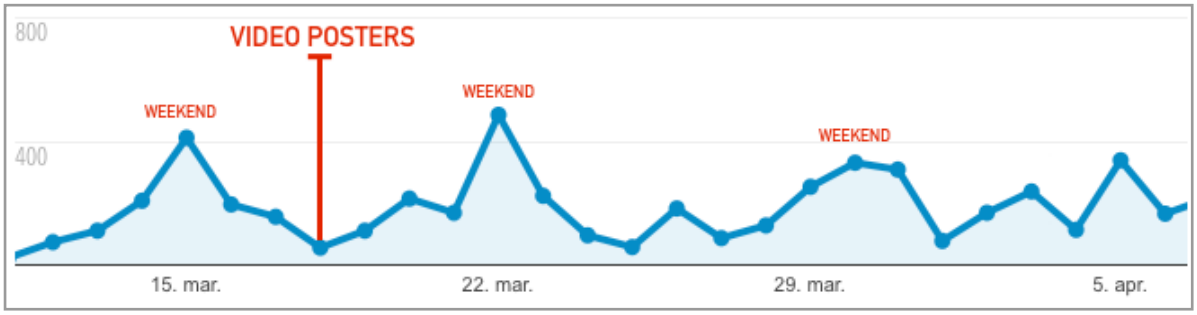

Figure 4: App usage data comparing the weeks before and after implementation of the video poster

It is evident that the inclusion of the video poster failed in facilitating the use of the non-idiomatic technology. Of course, the data can be interpreted in a number of ways - e.g. if the experiments focus on one digital zone affected the data or if more qualitatively whether the guests who noticed the poster, actually read it to the end.

However, our assessment points back to the above-mentioned idioms of video as medium itself: creating empathy and persuading about a point of view. The video scenario mainly seeks to create intrinsic motivation by showing desirable experiential potentials of using the app. We now hypothesized that the intrinsic value of a user experience with a technology is tightly connected to the decoding of its idiomatic semantics, which we took up as the challenge for a second experiment.

2.3 Example 2: Social Media Competition

Instead of focusing on creating an empathetic understanding of both the utility and desirability of using the app during their visit, we now experimented with heightening the utility dimension as much as possible. Buchanan (2001) describes utility as concerned with the fundamental assessment of whether a product contributes in a given context. Whereas the first intervention sought to make an intrinsic motivation towards the app's perceived user experience delivered, we now introduced an extrinsic reward to increase the perceived utility of using the app.

We arranged this as a social media competition, challenging the quest on one specific day to make an augmented reality movie during their visit, and share it on Facebook. The families would then participate in a competition, being able to win a year pass for the zoo. The setup was facilitated by the zoo via their online platforms (web-site and Facebook), but not with manned support and guidance as to how to use the app in the exhibition.

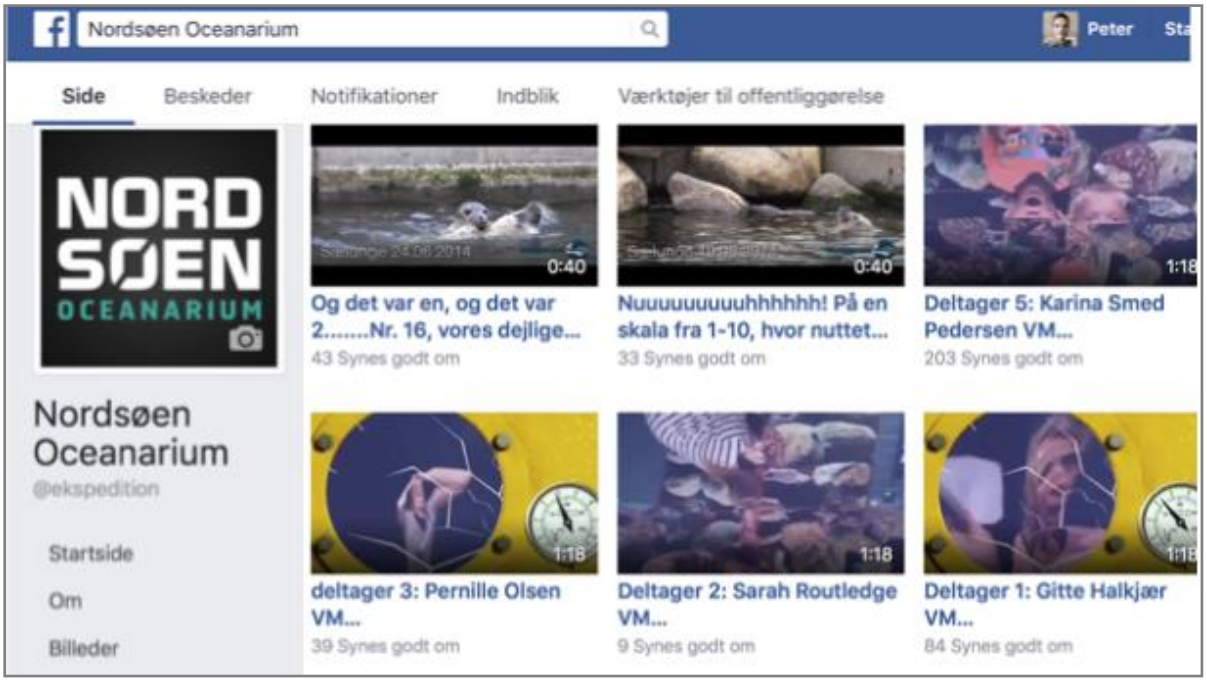

Figure 5: Augmented reality videos submitted to the zoo's Facebook page by guests during the event

The videos uploaded to Facebook created a substantial social media influence by reaching 6.664 profiles and gaining 508 likes on the videos. Once again we combined observation in the exhibition area with usage data. From the observed behavior, it seemed as more people had made themselves familiar with the app before their visit, having already downloaded the app upon arrival. Furthermore, it was evident that when these guests started using the app right away, they seemed to attract the attention of the other guests. This seemed to generate a momentum where initial use gradually spawned more users.

This pattern was confirmed when examining the usage data of the app, comparing the before and after usage with the use at the specific day of the event.

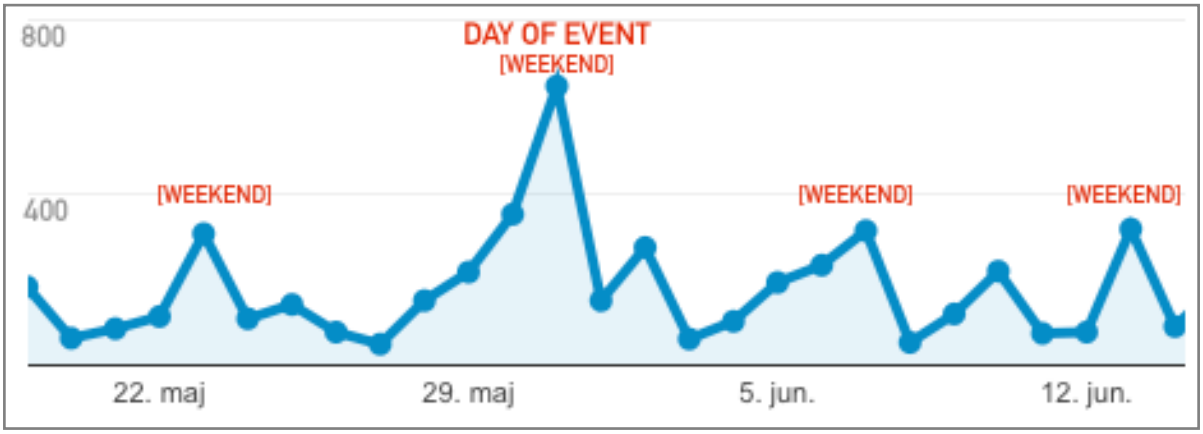

Figure 7: App usage data showing the spike in active users during the event, compared the otherwise stagnant use

When the extrinsic motivation of the competitive element was added, the weekend use of the app doubled compared to the weeks before. While an intrinsic motivation is preferable (where guests recognize the experiential value of the non-idiomatic technology as it is), the actual facilitation of decoding this experiential value seems hard to do without an initial extrinsic motivation. Due to the lack of cultural and functional experience with e.g. augmented reality, the perceived value of using the technology was simply too low for many of the guests to see the app as a meaningful part of their visit. When adding the extrinsic element of a reward from using the app in a competition, the perceived value changed. This presents a paradox. While the extrinsic motivator enables more guests to become familiar with the use of augmented reality, and thus beginning to establish idiomatic knowledge about the technology, it is not the desirability, utility or usability of the technological concept itself which facilitated this, but the external influence of the more idiomatic social media competition.

As such, a synthesized lesson learned is that before the establishment of idiomatic conventions, it is challenging to rely solely on intrinsic motivations for the 'first use' of new technological concepts. Furthermore, our indications show that extrinsic motivations might be used to gradually appropriate the user culture in the context of the non-idiomatic technology.

3. Case 2: Alternate Reality mobile treasure hunt

The second case was an Alternate Reality-based mobile treasure hunt called Noorhjem, which the user could participate in from 31 cultural and historical points of interest as well as theme parks in Northern Jutland. The mobile treasure hunt was technologically based on SMS-messages and IVR-calls (Interactive Voice Response) and virtually connected to hidden physical cues at the 31 locations. Each of the 31 quests was location-based, interactive and was designed as an independent mobile mini game. Noorhjem was designed to add a digital layer of information to the guests' visiting experience thus Noorhjem could be played independently of the other experiences within 31 locations, e.g. the other rides and amusements within a theme park.

This case is based on 32 observation studies, 3 shadowing studies, and 101 semi-structured qualitative interviews, where we mapped the challenges of alternate reality as a non-idiomatic technology. We present three examples regarding introduction of the concepts of non-idiomatic technology during the timespan of the project, which ran from 2010-2011.

3.1 Example 1: Understanding the concept

The first challenge emerged during the users' first encounter with Noorhjem; that is when the user saw the poster or the small plate on the pole for the first time (figure 8).

Figure 8: Large poster including 3 step-by-step guide to Noorhjem and a small plate on a pole

A majority of the users had difficulties understanding the concept of Noorhjem. Many thought it was a mobile game they could download to their phone. This discouraged potential users of the mobile treasure hunt to sign up and begin the first quest. Furthermore, our studies showed that within families the parents held the children back from signing up even though the children clearly showed interest in Noorhjem. Several times we even saw, that the parents gently pulled the arms of the children to get them to move along, as the children was intrigued by the illustrations on the posters.

The reason was that the parents had difficulties understanding the concept of Noorhjem as well as difficulties in estimating the amount of time it would require. Basically, the parents had some concerns about the concept. When approached by the researchers after reading the posters, several parents asked for a flyer, brochure or even a treasure map explaining Noorhjem and how to begin. After the researchers presented and explained Noorhjem to the parents, the majority had no concerns of letting their children sign up for Noorhjem. As we saw in case 1, case 2 also documents, that there is a great challenge in communicating the desirability dimension of non-idiomatic designs unless there is a manned guiding or support.

3.2 Example 2: Engaging in Noorhjem

At the time, the year 2010-2011, IVR-calls and SMS-quiz or SMS-voting was a known type of interaction for the users and thus, idiomatic. However, the combination of both IVR-calls and SMS-quizzes connected with physical cues hidden within a theme park was relatively unknown and unexplored. Thus, the concept could be considered non-idiomatic. In general, Noorhjem was approached by the users in two different ways categorizing the users in two overall types: The causal users and the dedicated or engaged users.

The casual users approached Noorhjem as an extra or supplementary experience to the main experiences, amusements, and rides in the theme park. These users would participate in a quest when they had a few minutes to spare between the main experiences in the park or during the walk to the next ride. For some this resulted in a somewhat negative experience when interacting with the system, as the users sometimes received the IVR-call during a rollercoaster ride. When interviewed,

it became clear that the casual users misunderstood the minimalistic posters and thereby misunderstood how to engage in Noorhjem.

The dedicated users, on the other hand, approached Noorhjem as a mobile experience on the same level as any given ride in the theme park. These users immersed themselves into the Noorhjem experience and focused on completing the given quest before entering a new physical ride. The dedicated users read and understood the posters in an entirely different way than the casual users, and thereby participated in Noorhjem as Noorhjem was designed and intended to.

This challenge shows how known idiomatic formats - the posters - can be used to facilitate the use of non-idiomatic technologies, but that the non-idiomatic format can also be interpreted differently based on the individual user and the context, with regard to their experiential knowledge with both the technology and purpose of using the concept. We will not dive into this area of research as this is a paper worthy in itself. However, we do want to point out the challenge of designing for several types of users, as the individual users might interpret the format differently from each other.

3.3 Example 3: Interacting with the system

The Bluetooth technology was rather widely known and used amongst the users we interviewed. Many of the users utilized the Bluetooth functionalities on their mobile phones daily to share images, music, and video files with their friends. Thus, we installed Bluetooth nodes behind the large posters of Noorhjem, which would push images and audio files of the voices of the characters of Noorhjem to the users' phones, expecting users to easily download the files. However, this was not the case, as only a small fraction actually downloaded the files.

The observation studies and interviews revealed that even though the entire poster was a very large 3-step guide on how to download the content via Bluetooth, almost nobody understood, that the user should be within the proximity of the poster to download the content. Several of the interviewed were confused about "where do I need to go to download the content?" - even when standing right in front of the poster reading the guide out loud.

From an idiomatic perspective, this is interesting. The example shows that even though the user understands the idioms of the technology as well as the guide, it is for the user not obvious that the physical location of the poster with the guide is the same location for interacting with the technology - in this case, receiving content from the Bluetooth node. We argue, that even though concepts in general are based on idiomatic technologies, the designer must clearly illustrate to the user (a) how to utilize and interact with the technologies, and (b) where the user must be placed to interact with the technologies if the specific use of the technology is not to become non-idiomatic. For instance, as described in case 1, where we used light spots on the floor to clearly indicate to the user, where the user should be positioned to interact with the system.

Challenges of unmanned non-idiomatic technologies

The two cases reveal a number of challenges when moving from manned and assisted introduction of non-idiomatic technologies, to implementation of non-idiomatic technologies in unmanned settings. We argue that the lessons learned from those challenges can benefit future design of non-idiomatic technologies in unmanned attractions and cultural points of interest, as we see an increasing number of unmanned attractions emerging. This tendency has been on the rise in recent years due to economic constraints that are forcing certain attractions to shut down permanently (Micklethwait 2011, Taul 2014). As an alternative to shutting down, technological interventions are sought out to facilitate unmanned experiences at exhibition sites.

As the two cases reveal, there is a potential for creating supplementary digital visiting-experiences for guests at unmanned attractions by implementing technologies. A large body of existing research support this, such as self-guidance through mobile devices at exhibitions (Pendit et al 2014, Jung et al 2016). Furthermore, these studies point towards specific types of technologies that are particularly prospective and versatile for use in attractions, where unmanned experiences are required (Chen et al 2016). Within the research exists a host of different instantiations of mobile and context-aware technologies. Common for the technologies is that they are not exclusive nor gated; merely re-configurations of technology types that the user is already wielding. Yet, the cases we have presented, along with other similar endeavors, demonstrate the broader audience's limitations, as to understanding non-idiomatic use of emerging technology types.

State of the art implementations of context-aware, mobile applications, show that there is a widespread adoption and openness amongst users in using these platforms, as seen in both the cases presented in this study; when the users know what to do and how it works. Furthermore, studies have shown a positive (desirable outcome) when there is a connection to the context in which they are represented, i.e. location dependent content (Chang et al 2015). Exactly as the dedicated users of Noorhjem (case 2) is an example of. Thus, for design of future location-based services we argue, that the content has to be tightly integrated with the exhibition.

In the existing body of research, evaluations of the technologies themselves are detailed; the challenge of on-boarding new users is, however, not represented. Participants are recruited to test the developed systems, but the challenge of getting real potential users in real contexts, to willingly on-board and try these systems, are seldom, if ever the objective of the study. Most of the existing research points to how to make something out of non-idiomatic technologies, but not so much how to make user's use it on their own volition. Therefore, we argue that there is a void here left unchecked, that is a gap in the design process.

Conclusions

In this paper, we have examined whether the use of non-idiomatic technologies be facilitated through idiomatic technological practices. Both cases identify patterns pointing to a general neglect of properly introducing the desirability, utility and usability, which is a prerequisite for new users to appropriate and adopt the desired product. The identified patterns are (a) lack of understanding how the concept is a desirable addition to the visit (i.e. 'what is the value of the app?'), (b) lack of understanding of the functionality (i.e. 'what does it do?') and (c) motivation for using the concepts during the visit. In addition to these patterns, other design challenges emerge, such as in case 2, examples 1 and 3, in understanding the concept as well as understanding how to interact with the underlying system. Meaning solutions should include an in-depth understanding of the context and integrating it seamlessly into the overall experience of the concept.

In case 1, the shift from intrinsic motivation to extrinsic showed positive results by instigating a desire to start using the app. Building on this, i.e. using extrinsic motivation, a history of using game design elements, rooted in behavioral psychology, has shown positive (desired outcomes) from different types of concepts in similar contexts it was possible to motivate the guests to traverse the site playing games (Chang et al 2015, Carolei & Schlemmer 2015). Our results support this pattern, pointing towards gamification with idiomatic technologies, such as social media, as a path to examine appropriation and adoption of non-idiomatic technologies.

By looking at the patterns that emerge from the two cases, and applying elements from game design, future work on the challenge of supporting the user interaction of non-idiomatic technologies through idiomatic conventions, could be achieved through gamified interventions, where extrinsic rewards can support the intrinsic experience. These interventions must however, take into

consideration the challenges identified, such as making it clear to the guest, where and when to interact with the system.

References

Buchanan, R. (2001). Design Research and the New Learning. Design Issues, 17(4), 3–23.

Carmigniani, J., Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., & Ivkovic, M. (2011). Augmented reality technologies, systems and applications. Multimedia Tools and Applications, 51(1), 341–377.

Carolei, P., & Schlemmer, E. (2015). Alternate Reality Game in Museum: A Process to Construct Experiences and Narratives in Hybrid Context. IEEE - Educational Technology & Society.

Chang, Y.-L., Hou, H.-T., Pang, C.-Y., Sung, T.-T., & Chang, K.-E. (2015). Apply an Augmented Reality in Mobile Guidance to Increase Sense of Place for Heritage Places. 166-178.

Chen, G., Zhang, Y., Chen, N.-S., & Fan, Z. (2016). Context-Aware Ubiquitous Learning in Science Museum with iBeacon Technology. Springer.

Chow, M. D. (1989). The role of the video professional in a research environment. ACM SIGCHI Bulletin, 21(2), 83–87.

Cooper, A., Reimann, R., & Cronin, D. (2012). About Face 3: The Essentials of Interaction Design. John Wiley & Sons

Fallman, D. (2003). Design-oriented human-computer interaction (p. 225). ACM

Forlizzi, J., Zimmerman, J., & Stolterman, E. (2009). From Design Research to Theory: Evidence of a Maturing Field. Presented at the International Association of Societies of Design Research.

Huge Lawn. (2013). North Sea Movie Maker [IOS]. Huge Lawn - Miracle Apps; Nordsøen Oceanarium; Center for Interactive Digitale Medier, Aalborg University. Retrieved from https://itunes.apple.com/gb/app/north-sea-movie-maker/id717083654?mt=8

Jung, T., Dieck, M. C., Lee, H., & Chung, N. (2016). Effects of Virtual and Augmented Reality on Visitor Experience in Museum. Information and Communication Technologies in Tourism, Springer.

Krevelen, D. W. F., & Poelman, R. (2010). A survey of augmented reality technologies, applications and limitations. International Journal of Virtual Reality, 9(2), 1.

Krumm, J. (2016). Ubiquitous Computing Fundamentals. CRC.

Lindell, R. (2012). Code as Design Material. In Participatory Materialities Workshop and Symposium at Aarhus University.

Löwgren, J. & Stolterman, E. (2004). Thoughtful Interaction Design: A Design Perspective on Information Technology. MIT Press.

Löwgren, J. (2012). Löwgren - Keynote at IxD 2012. Retrieved January 25, 2016,

Löwgren, J. (2016). On the significance of making in interaction design research. Interactions, 23(3), 26–33.

Micklethwait, J. (2013, 12 21). Temples of delight. Economist. Retrieved 03 03, 2016, from https://goo.gl/dtg99v

Pendit, U. C., Zaibon, S. B., & Bakar, J. A. (2014). Mobile AR for Cultural Heritage Site towards Enjoyable Informal Learning: A Revised Conceptual Model. Information Management and Business Review.

Raijmakers, R., Sommerwerk, A., Leihener, J., & Tulusan, I. (2009). How sticky research drives service design. In Service Design Network conference in Madeira.

Taul, B. (2014). Museer: Hovedtal. (Danmarks Statistik) Retrieved 03 03, 2016, from https://goo.gl/JTKVU4

Vistisen (2016) Animation-based Sketching, PhD-thesis, Aalborg University Press

Peter Vistisen, PhD, is assistant professor at Aalborg University, with a research interest in the intersection between technology and the liberal arts. Peter's research focuses on developing design approaches for early exploration of the viability, feasibility and desirability of technologies.

Claus Pertou Østergaard, Ph.D, is assistant professor at Aalborg University, with a research interest in mobile user experience and interactive digital media. Claus' research focus among other areas on developing theoretical and methodological frameworks for exploring, understanding, and designing mobile user experiences.

Rameshnath Krishnasamy, Ph.D. fellow at Aalborg University. Krishnasamy's research foci resides on the fulcrum between human and technology, through exploration of pervasive and ubiquitous technologies, and their potential to deliver context-aware digital experience layers, with an emphasis on user experience.